Caribbean Community

EDICT OF GOVERNMENT

In order to promote public education and public safety, equal justice for all, a better informed citizenry, the rule of law, world trade and world peace, this legal document is hereby made available on a noncommercial basis, as it is the right of all humans to know and speak the laws that govern them.
CARICOM REGIONAL STANDARD FOR RUM

Specifications

CRS 25: 2008
(formerly CCS 0025: 1992)
CARICOM REGIONAL STANDARD FOR RUM

Specifications

CRS 25: 2008
### AMENDMENTS ISSUED SINCE PUBLICATION

<table>
<thead>
<tr>
<th>AMENDMENT NO.</th>
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ATTACHMENT PAGE FOR CRS AMENDMENT SHEETS
Committee Representation

Specification Committee

The Specification Committee responsible for the formulation of this Caricom Regional Standard was principally constituted from Members of the regional association WIRSPA (West Indian Rum and Spirits Association). Comments from Stakeholders throughout the CARICOM Member states were also solicited and incorporated in this current document.
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Foreword

This standard is a revision of, and a replacement to, CCS 0025:1992. It has been revised through the CARICOM Regional Organisation for Standards and Quality (CROSQ) for use by manufacturers, distillers, bottlers and importers of rum to ensure that Caribbean consumers get a product of good quality and also to serve and protect CARICOM rum producers in the overseas market.

Revision of the CCS 0025:1992 rum standard was initially undertaken in 2005. This particular revision was driven by the need to respond adequately to various technical issues raised by CARICOM rum trading partners. The standard, CCS 0025 : 1992, was an adaptation of the Barbados Rum Standard BNS 140:2005 Rum and JS 166:1988 Jamaican Standard Specification for Rum.

This current revision was approved at the Twenty-fifth Session of the Council for Trade and Economic Development (COTED) in November 2008.
1 Scope

This standard provides a definition for the commodity designated as rum and prescribes acceptable methods for sampling and analysis of rum.

2 Definitions

For the purpose of this standard, the following definitions shall apply:

2.1 age

the length of time the rum has been placed in a wooden vat or barrel for continuous maturation.

2.2 alcohol

the term "alcohol", when used without a qualifying adjective, refers to ethyl alcohol \( (C_2H_5OH) \) and includes all concentrations of this substance in water.

2.3 alcohol, methyl (methanol)

the simplest of all alcohols, having the chemical formula \( CH_3OH \).

2.4 alcoholic fermentation

the process by which fermentable sugars are converted into alcohol by the action of enzymes using microorganisms.

2.5 caramel

colouring matter made by heating cane or other sugars under controlled conditions. It is a wholesome colouring matter widely used in the liquor and beverage industry.

2.6 distillation

the process of purifying a liquid by vaporization followed by condensation.

2.7 ethyl carbamate

also known as carbonic acid ethyl ester, urethane, or ethyl urethane.
2.8  
**fermentation alcohol**  
alcohol produced by the fermentation of raw materials containing monosaccharides, disaccharides, and polysaccharides after hydrolysis.

2.9  
**spirit**  
as ordinarily used, this term refers to any distilled liquor (such as brandy, whiskey, rum or gin). It is also employed as a synonym for unflavoured alcohol of any strength.

2.10  
**spirit caramel**  
caramel for use in rum that is negatively charged and specific for the alcoholic strength of the product.

2.11  
**strength**  
the concentration of alcohol present.

2.12  
**natural flavouring material**  
preparation acceptable for human consumption, obtained exclusively by physical processing from vegetable, and sometimes animal raw materials, either in their natural state or processed for human consumption.

3  **General requirements**

3.1  Rum shall be a spirit drink:

a) obtained exclusively by alcoholic fermentation and distillation of sugar cane molasses, sugar cane syrups, sugar cane juices or cane sugar produced during the processing of sugar cane;

b) distilled at an alcohol content of less than 96.0 % alcohol by volume at 20 °C;

c) produced in such a way that the product has the organoleptic characteristics derived from the natural volatile elements contained in the above raw materials or formed during the fermentation or distillation process of the named raw materials; and

d) which includes mixtures solely of the above distillate.

3.2  Flavoured rum is rum to which has been added natural flavouring materials. Flavours may be added up to a maximum of 2.5 % by volume of the finished product, with or without the addition of sugar, and bottled in accordance with the excise laws of the country in which it is sold.

3.3  The name of the predominant flavour shall appear as part of the product designation.
3.4 Ethyl alcohol content shall not be less than 40 % by volume, but may vary according to the excise legislation of the country of sale and shall be determined according to the method prescribed in Annex A or any other method deemed suitable by CROSQ. The tolerance levels for ethyl alcohol shall be as prescribed by the excise legislation of the country of origin.

3.5 Rum shall be colourless except where the colour is derived from wood during maturation or from caramel produced from sugars.

3.6 All rums for sale and consumption within CARICOM Member States shall comply with the specification in item 3.1.1.

NOTE Rums for export outside CARICOM may have added to them such other blenders and flavours as are permitted by the standards of the importing country.

EXAMPLE In the United States, Alcohol Tobacco Tax and Trade Bureau's Regulation 27 CFR 5.23 (a).

3.7 Bottled rum shall be free from permanent sedimentation or suspended matter of any type.

3.8 Rum shall be manufactured in premises built and maintained in a good hygienic condition satisfactory to the competent national authority responsible for food safety.

3.9 Rum shall be reduced in strength only by the addition of potable water.

3.10 Rum shall be produced in accordance with the requirements of the distillation certificate specified under the excise legislation of the country of origin.

3.11 Tests for artificial colour, methyl alcohol and ethyl carbamate shall be carried out as prescribed in the appropriate annexes mentioned in Table 1 or by other suitable methods approved by CROSQ.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specifications (at drinking strength 40 % alcohol)</th>
<th>Method of test (Refer to Annex)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial colour (not including caramel)</td>
<td>nil</td>
<td>B</td>
</tr>
<tr>
<td>Methyl alcohol (maximum)</td>
<td>Not more than 200 mg/kg (200 ppm)</td>
<td>C</td>
</tr>
<tr>
<td>Ethyl carbamate</td>
<td>Not more than 0.15 mg/kg (150 ppb)</td>
<td>E</td>
</tr>
</tbody>
</table>

4 Packaging

4.1 Rum shall be filled in any suitable container which does not impair the quality of the rum.

4.2 Rum shall not be packaged in containers that are made from, or lined with, a material that may contaminate the product in such a way as to make it injurious to health.

4.3 Rum containers shall be properly sealed.
5 Labelling

5.1 General requirements

5.1.1 Labels shall be so designed that the label statements remain conspicuous and legible under normal conditions of purchase and use. Such statements shall be on a contrasting background.

5.1.2 Labels shall be designed according to the mandatory labelling information required by 5.2.1 and 5.2.2. Labels may contain additional information, provided that such information does not conflict with, or in any manner qualify, those statements required by the mandatory labeling standards.

5.1.3 The label shall not contain any statement, design, or device which either states or implies that the use of any distilled spirit has curative or therapeutic effects.

5.1.4 Geographical names shall not be applied to rum produced in any region other than the particular place indicated by the name.

5.2 Detailed requirements

5.2.1 The labelling requirements specified in this standard shall be in the official language(s) of the country in which the product is being sold and in addition, shall show the following on the principal display panel of the label:

a) brand name;
b) product name;
c) alcoholic content; and

d) net content.

5.2.2 The brand name shall appear in conjunction with the product name. Where it may be misleading, the word "brand" shall appear in direct conjunction with the brand name.

5.2.3 The name of the product shall be "rum" and it shall contain not less than 40 % alcohol by volume (refer to 3.2). The alcohol content shall be conspicuously stated on the label.

5.2.4 Where the term "white rum" appears, the product shall be colourless.

5.2.5 The alcoholic content of rum shall be stated as "% alcohol by volume". The equivalent U.S. Proof may be added in close proximity to the required declaration of alcoholic content. Where the term "Over Proof" appears, it shall be deemed to be Sykes Proof strength, in which case the product shall contain not less than 57.1 % alcohol by volume.

5.2.6 The net content shall be stated in appropriate units in accordance with the labelling requirements of the country of origin.

5.2.7 The net content shall be the average net content as determined by the sampling and measurement procedure set out in the most recent edition of International Recommendation OIML R87 of the International Organization of Legal Metrology (OIML).
5.2.8 The following additional statements shall appear on any part of the label:

a) the name and address of the manufacturer; and

b) the country of origin.

5.2.9 The name and address of the manufacturer shall be the name and address of the place of business of the distiller or bottler of the product. It shall be preceded by the words "Manufactured by....", "Distilled by....", "Bottled by...." as applicable.

5.2.10 The country of origin shall be prominently and clearly stated and it shall be immediately preceded by the words "Product of....".

5.3 Optional requirements

5.3.1 The following are optional requirements for the labelling of rum:

a) a statement of age - where a statement of age is given, it shall be shall be that of the youngest distilled spirit in the product and shall be expressed in terms such as "___ years old"; and

b) a statement of maturity - where a statement of maturity is given, the rum shall have been suitably matured in wooden vats or barrels for not less than one year.

5.3.2 The label shall conform to any additional requirements given in the labelling requirements of the country in which the product is to be sold.

6 Sampling

The method of drawing representative samples of the rum and the criteria for conformity shall be as prescribed in Annex D.

7 Quality of reagents

Unless otherwise specified, distilled water (or water of at least equal purity) and chemicals of reagent or analytical grade shall be used throughout the tests.
Annex A
(normative)

Determination of ethyl alcohol

A.1 Introduction

Ethyl alcohol content shall be determined by the method prescribed below or by any internationally approved and validated distillation method.

EXAMPLE AOAC – Association of Analytical Chemists' Manual.

A.2 Apparatus

Gas chromatograph with flame ionization detector.

Column: 1.5 m glass - internal diameter 4 mm packed with Poropak Q.

Operating conditions: column temperature 160°C, isothermal detector 250 °C and injector temperature 200 °C.

Carrier gas - nitrogen: flow-rate 40 ml/min.

Internal standard - isopropanol - G.C. grade.

A.3 Procedure

A.3.1 Prepare a 2.5 % (v/v) standard mixture of ethanol and isopropanol (at 20°C) using 2.5 ml of each in 100 ml water. Inject a 0.4 µl volume into the gas chromatograph. Repeat injections to obtain similar peak areas for different injections of the same volume. Measure the peak area for the ethanol and isopropanol.

A.3.2 Prepare a sample mixture containing 5 % (v/v) rum and 2.5 % (v/v) isopropanol (at 20 °C). Inject 0.4 µl into the gas chromatograph. Repeat injections to obtain similar peak areas for different injections of the same volume. Measure the peak area of the ethanol and isopropanol.

A.4 Calculations

A.4.1 The volume of the component is directly proportional to the area of the peak.

\[ \text{i.e. } V \propto A \]

or, \[ V = kA \]
Hence, for ethanol \( V_e = k_e A_e \)

Hence, for isopropanol \( V_p = k_p A_p \)

Therefore \( V_e / V_p = k_e / k_p A_e / A_p \), equation (1)

Take \( k_e / k_p = K \) equation (2)

Therefore \( V_e / V_p = K A_e / A_p \), equation (3)

\( K \) can be calculated from the results for the standard mixture used as in A.3.1, where \( A_e, A_p \), are the areas of the peaks for ethanol and propanol.

Using the areas of the peaks for ethanol and propanol obtained in A.3.2

substituted in equation (3), calculate \( V_e \) for the rum sample.
Annex B
(normative)

Determination of artificial colour

B.1 Introduction

This test may be carried out by the method prescribed below (MARSH TEST) or by any internationally approved and validated method.

EXAMPLE By high performance liquid chromatography (HPLC).

B.2 Reagents

B.2.1 Marsh reagent

Mix together 100 ml of amyl alcohol, 3 ml of phosphoric acid and 3 ml of water.

B.2.2 Fusel oil or amyl alcohol.

B.2.3 Pectin solution

Dissolve 1 g of pectin in 75 ml water, add 25 ml alcohol to preserve, and shake well before using.

B.2.4 DNPH solution

Dissolve 1 g of 2,4 dinitrophenylhydrazine in 7.5 ml Sulphuric acid and dilute to 75 ml with alcohol. (If kept in a glass-stoppered bottle, the solution will remain clear and stable for several months.)

B.3 Procedure

B.3.1 To 10 ml of the sample in a 20 ml test tube, add enough freshly shaken Marsh reagent (B.2.1) to nearly fill the tube and shake several times. Let the layers separate. Colour in the lower layer indicates that the sample has been coloured with caramel, synthetic dye, or extractive material from uncharred white oak chips.

B.3.2 In the absence of any colour, test 10 ml in the same manner, using enough fusel oil (B.2.2) to nearly fill the tube and shaking several times. A deeply coloured lower layer indicates synthetic dye. To confirm caramel, apply the following Mathers test.

B.3.2.1 Place 10 ml of the filtered sample in a centrifuge tube. Add 1 ml of pectin solution (B.2.3) and mix. Add 3-5 drops hydrochloric acid and mix. Fill the tube with alcohol (about 50 ml), mix,
centrifuge, and decant. Dissolve the precipitate in 10 ml of water, and add hydrochloric acid and alcohol as above. Shake well, centrifuge and decant. Repeat the operation until the alcoholic liquid is colourless. Finally, dissolve the gelatinous residue in 10 ml hot water. If the solution is colourless, caramel is absent. If the solution is clear brown, caramel may be present. Confirm this by adding 1ml of 2.4 - DNPH solution (B.2.4), then mix, and heat for 30 min in boiling water. A precipitate forms if caramel is present.
Annex C
(normative)

Determination of methyl alcohol

C.1 Introduction

The determination of Methyl alcohol content may be carried out by the method prescribed below or by any internationally approved and validated method.

C.2 Apparatus

C.2.1 Gas chromatograph - equipped with flame ionization detector.

C.2.1.1 Column - 23% carbowax 1500 (m/m) on Chromosorb W (60-80 mesh, acid-washed). Weigh 9 g carbowax 1500 into a 250 ml beaker and mix with water on a steam bath. Weigh 30 g chromosorb W in a 250 ml beaker and combine with the carbowax solution in a large flat-bottom polyethylene container (about 20 cm x 25 cm). Add water to just cover the solid support and mix thoroughly. Evaporate the water with frequent stirring in a hood. (Gentle steam may be applied to hasten evaporation.) After evaporation of the water, heat the coated support for about 2 h in a 100°C oven. Pack 2.4 m of 6 mm diameter copper tubing tightly and evenly by repeated tapping, and condition in a column oven at 150°C with helium flow rate of 150 ml/min until a steady baseline is observed at attenuation 1x at operating parameters (about 24 h).

C.2.2 Approximate parameters - Column temperature 70°C (isothermal); detector and inlet temperature 150 °C; Helium carrier flow 150 ml/mm. Optimum operating conditions vary with column and instrument, and shall be determined by using standard solutions. Adjust the parameters for maximum peak sharpness and optimum separation. With high-level standards, 1-propanol should give almost complete baseline separation from ethanol.

C.2.3 Syringe – 10 µl, Hamilton Co No 701, or equivalent.

C.3 Reagents

C.3.1 Alcohol - USP, methanol-free

Methanol stock solution - Dilute 10 ml methanol, 99.9 mol % (Fisher Scientific Company, A-936, or equivalent) to 100 ml with 40 % alcohol.

C.3.2 1-Butanol internal standard stock solution

Dilute 10 ml 1-butanol, 99.9 mol % (Fisher Scientific Company, A-384, or equivalent) to 100 ml with 40 % alcohol.
C.3.3 Methanol standard solution

0.050 % methanol plus 0.030 % 1-butanol internal standard. Fill a 100 ml volumetric flask to about 99 ml with 40 % alcohol and add, by syringe, 500 µl methanol stock solution (C.3.2), and 300 µl 1-butanol stock solution (C.3.3). Mix and dilute to volume with 40 % alcohol. Mix again.

C.4 Determination

C.4.1 Inject 10 µl methanol standard solution. Adjust operating parameters and attenuation to obtain measurable peak height (about ¼ full-scale deflection). Determine the retention time of methanol and 1-butanol (about 3 and 12 min respectively). Inject 10 µl of the sample to estimate the methanol, using attenuation if necessary, and to check for absence of 1-butanol. On the basis of the presence or absence of 1-butanol in the sample, determine the methanol content from a standard curve prepared according to C.4.1.1 or C.4.1.2.

C.4.1 1-butanol absent

On the basis of the estimation of methanol, prepare a series of standards (4 or 5) in which the range of concentration includes the methanol concentration in the sample. Add internal standard (C.3.3) to both the samples and standard solutions at a concentration similar to that of methanol in the sample. Calculate the peak height ratios of methanol, 1-butanol, using averages of duplicate injections, and plot the ratios against methanol concentration.

C.4.2 1-butanol present

Prepare a series of methanol standards as in C.4.1.1, but do not add the 1-butanol internal standard to the sample or methanol standards. Plot the actual peak height of methanol against the concentrations.
Annex D
(normative)

Scale of sampling

D.1 General requirements

D.1.1 In drawing, preparing and handling samples, the following precautions and directions shall be observed as far as possible.

D.1.1.1 Sampling shall be done by a qualified person who may be a person with statutory authority and, if desired, may be carried out in the presence of the purchaser (or his representative) and the vendor (or his representative).

D.1.1.2 To obtain a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by suitable means.

D.1.1.3 Precautions shall be taken to protect the sample from extraneous contamination.

D.1.1.4 The sample shall be stored in a cool, dark and dry place.

D.2 Scale of sampling

D.2.1 All the cases with containers of the same size, containing material of the same type, grade, class and composition, and manufactured under the same conditions and at the same time, shall constitute a lot or batch.

D.2.2 All the containers drawn from a particular lot shall be considered a sample for testing purposes.

D.2.3 A sample from each lot shall be tested for ascertaining conformity of the material to the requirements of the specification.

D.2.4 The number of containers to be selected from each lot shall be in accordance with Table D.1.

D.2.5 The containers shall be selected at random. In order to ensure randomness of selection, random number tables shall be used. If random number tables are not available, the following procedure shall be used:

"Starting from any case, count 1,2,3,4..... "r", in a systematic manner. Every "r^{th}" case thus counted shall be withdrawn until the desired number is obtained; "r" being the integral part of N/n, where "N" is the total number of cases in the lot, and "n" is the number of cases to be selected. One container shall be drawn from each case."
D.2.6 All the cases selected shall be opened and the containers examined visually for the conditions of packing, the external appearance and the fill.

D.2.7 Sampling shall be done in accordance with Table D.1. The effectiveness of the sampling plan is dependent on the execution of proper quality control procedures.

**Table D1 - Sampling plan for physical and chemical requirements (AQL = 6.5)**

<table>
<thead>
<tr>
<th>Lot size (cases)</th>
<th>Sample size (cases)</th>
<th>Acceptance number (cases)</th>
<th>Rejection number (cases)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 50</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>51 – 500</td>
<td>8</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>501 – 3200</td>
<td>13</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3201 – 35000</td>
<td>20</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>35001 – 500000</td>
<td>32</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Over 500000</td>
<td>50</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

D.2.8 Tests shall be made on the composite sample prepared by thoroughly mixing equal quantities from the individual sample containers. The result shall satisfy the requirements of this standard.
Annex E  
(normative)

Determination of ethyl carbamate

E.1 Introduction

The determination of ethyl carbamate, apart from the method prescribed below, may be carried out using any of the prescribed methods for its determination, as stated in the AOAC Manual.

E.1.1 Apparatus

Gas chromatograph, Varian 6000 or equivalent, equipped with auto-sampler or manual injection system, split-less, for injecting about 2 µl volume.

E.1.2 Hall detector in nitrogen mode

Table E.1 – Conditions for the hall detector in nitrogen mode

<table>
<thead>
<tr>
<th>Area / Item</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Furnace</td>
<td>840 °C</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>80 ml/min</td>
</tr>
<tr>
<td>Helium</td>
<td>30 ml/min</td>
</tr>
<tr>
<td>Vent</td>
<td>Vent at all times, including between samples, except for a 2 – 3 min window for measuring ethyl carbamate.</td>
</tr>
</tbody>
</table>

E.1.3 Column: 30 m x 0.32mm DBWAX 0.5 µl film or equivalent

Table E.2 – Conditions for the column

<table>
<thead>
<tr>
<th>Area / Item</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate (helium)</td>
<td>about 1ml/min</td>
</tr>
</tbody>
</table>
| Temp. program | 50 °C hold for 2 min  
|              | 20 °C/min to 140 °C and hold 10 min  
|              | 10 °C/min to 250 °C and hold 10 min |
| Injector    | 240 °C    |
| Detector base | 250 °C   |
E.2.4 Centrifuge

E.2.5 Centrifuge bottles, 250 ml, fitted with appropriate polyethylene stoppers

E.2.6 Graduated centrifuge tubes, 15 ml

E.2.7 Rotary evaporator

E.2.8 Flasks for rotary evaporator, 500 ml

E.2 Reagents

a) Sodium chloride, reagent grade.

b) Methylene chloride, distilled-in-glass grade (see NOTE).

c) Ethyl acetate, reagent grade.

d) Ethanol, absolute, BP-USP.

e) Sodium sulphate, anhydrous, granular, reagent grade.

f) Standard solutions of ethyl carbamate:

1) stock solution 1 mg/ml (1 µg/µl);

2) dissolve 100 mg ethyl carbamate in ethyl acetate in a 100 ml volumetric flask, dilute to volume and mix well;

3) dilute stock solution (10 ng/µl);

4) pipette 1.0 ml of standard stock solution (1 µg/ µl) into a 100 ml volumetric flask, dilute to volume with ethyl acetate and mix well;

5) working standards;

6) prepare the following working standards with appropriate serial dilution of the dilute stock solution (10 ng/ µl) with ethyl acetate: 0.1, 0.25, 0.5, 1.0 and 2.0 ng/ µl;

7) spiking solution 2.0 µg/ µl; and

8) pipette 1.0 ml of standard stock solution 1 mg/ml into a 500 ml volumetric flask, dilute to volume with ethanol and mix well.

NOTE Since ethyl carbamate has been found in some lots of methylene chloride, each lot should be tested as follows:
Add 3ml of ethyl acetate to 100 ml of methylene chloride; evaporate to about 2 ml using a rotary evaporator at 28 °C (82 °F) and determine the presence or absence of a GC peak corresponding to ethyl carbamate. Use only methylene chloride which is free from ethyl carbamate.

E.3 Procedure

E.3.1 Extraction

E.3.1.1 Weigh about 15 g of rum into a 250 ml centrifuge bottle. Dilute to 50 g with water and mix well.

E.3.1.2 Add about 30 g of sodium chloride and swirl 1 min to saturate solution.

E.3.1.3 Add 75 ml of methylene chloride, stopper and shake vigorously for about 1.

E.3.1.4 Centrifuge until phases separate.

E.3.1.5 Draw off lower layer and filter into a 500 ml evaporator flask through 40 g anhydrous sodium sulphate on a Reeve Angel No. 202 or Whatman No. 1 filter in a conical glass funnel.

E.3.1.6 Repeat D.4.1.3 to D.4.1.5 twice for a total of three extractions.

E.3.1.6 Add about 3ml of ethyl acetate to the extract (about 225 ml) then reduce volume to about 2 ml using a rotary evaporator at 28 °C.

NOTE This is a critical step requiring care to ensure that sufficient evaporation takes place to remove all of the methylene chloride, which could damage the Hall detector scrubber. Extracts must not be evaporated to dryness or to near dryness. Adequate venting of the Hall detector, as previously indicated, is another precaution to minimize the effects of even traces of methylene chloride on the Hall scrubber.

E.3.1.7 Transfer to a 15 ml graduated centrifuge tube, rinse flask with 2 ml x 1 ml ethyl acetate, transfer rinses to the centrifuge tube, adjust volume to 5 ml and mix well.

E.3.2 Gas chromatography

E.3.2.1 Inject, manually or by using an auto-sampler, precisely measured volumes of about 2 µl of solutions:

a) for calibration curve – standards in increasing order of concentration (0.2, 0.5, 1, 2, and 4 ng);

b) for sample extracts – sample extracts interspersed with calibration standards and spiked sample extracts.

E.3.2.2 Compare retention time of samples and standards.

E.3.2.3 Dilute to a known volume any sample extract which exceeds the range of the calibration curve and inject again.
E.4 Calculations

E.4.1 Measure response (peak height or peak area) of each standard.

E.4.2 Prepare calibration curve by plotting response of each standard against ng ethyl carbamate injected. Measure response (peak height or peak area) of each sample.

E.4.3 Calculate concentration of ethyl carbamate in sample using the following equation:

\[
\text{ppm ethyl carbamate} = \frac{C}{W_x}
\]

where

C is ng ethyl carbamate read from calibration curve

Wx is sample weight equivalent in g in volume of sample injected

End of Document
The CARICOM Regional Organisation for Standards and Quality (CROSQ) was created as an Inter-Governmental Organisation by the signing of an agreement among fourteen Member States of the Caribbean Community (CARICOM). CROSQ is the regional centre for promoting efficiency and competitive production in goods and services, through the process of standardization and the verification of quality. It is the successor to the Caribbean Common Market Standards Council (CCMSC), and supports the CARICOM mandate in the expansion of intra-regional and extra-regional trade in goods and services.

CROSQ is mandated to represent the interest of the region in international and hemispheric standards work, to promote the harmonization of metrology systems and standards, and to increase the pace of development of regional standards for the sustainable production of goods and services in the CARICOM Single Market and Economy (CSME), and the enhancement of social and economic development.

**CROSQ VISION:**
The premier CARICOM organisation for the development and promotion of an Internationally Recognised Regional Quality Infrastructure; and for international and regional harmonized CARICOM Metrology, Standards, Inspection, Testing and Quality Infrastructure

**CROSQ MISSION:**
The promotion and development of standards and standards related activities to facilitate international competitiveness and the sustainable production of goods and services within the CARICOM Single Market and Economy (CSME) for the enhancement of social and economic development